

CHAPTER 13. UTILITY IMPACT ANALYSIS

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CHAPTER 13. UTILITY IMPACT ANALYSIS

13.1 INTRODUCTION

The Department of Energy (DOE) will analyze specific effects of its proposed standard levels on the electric and natural gas utility industry as part of the notice of proposed rulemaking analyses, using a variant of the U.S. DOE/Energy Information Administration (EIA)'s National Energy Modeling System (NEMS). The NEMS is a large, multi-sectoral, partial equilibrium model of the U.S. energy sector. EIA uses NEMS to produce the *Annual Energy Outlook* (AEO).¹ NEMS produces a widely recognized baseline energy forecast for the United States, and this energy forecast is available in the public domain. DOE will use a variant known as NEMS-BT to provide key inputs to the analysis.^a

The utility impact analysis will consist of a comparison between model results for the base case and for policy cases in which proposed standards are in place. The use of NEMS-BT for the utility analysis offers several advantages. As the official DOE energy forecasting model, NEMS relies on a set of assumptions that are transparent and have received wide exposure and commentary. NEMS-BT allows an estimate of the interactions between the various energy supply and demand sectors and the economy as a whole. The utility impact analysis will report the changes in installed capacity and generation, by fuel type, that result for each trial standard level, as well as changes in electricity and natural gas sales to the residential and commercial sectors.

DOE will conduct the utility impact analysis as a policy deviation from the 2007 version of the AEO (AEO2007), applying the same basic set of assumptions. For example, the operating characteristics (e.g., energy conversion efficiency, emissions rates) of future electricity generating plants are as specified in the AEO2007 reference case, as are the prospects for natural gas supply. DOE also will explore deviations from some of the reference case assumptions, to represent alternative futures. Two alternative scenarios use the high and low economic growth cases of AEO2007. (The reference case corresponds to medium growth.) The high economic growth case assumes higher projected growth rates for population, labor force, and labor productivity, resulting in lower predicted inflation and interest rates relative to the reference case and higher overall aggregate economic growth. The opposite is true for the low growth case. Starting in 2012, the high growth case predicts growth in per capita gross domestic product of 3.4 percent per year, compared with 2.9 percent per year in the reference case and 2.2 percent per year in the low growth case. As part of varying supply-side growth determinants in these cases,

^a For more information on NEMS, please refer to the U.S. Department of Energy, Energy Information Administration documentation. A useful summary is *National Energy Modeling System: An Overview 2000*, DOE/EIA-0581(2000), March 2000. EIA approves use of the name NEMS to describe only an official version of the model without any modification to code or data. Because this analysis entails some minor code modifications and the model is run under various policy scenarios that are variations on EIA assumptions, DOE refers to the model by the name NEMS-BT (BT is DOE's Building Technologies Program, under whose aegis this work has been performed). NEMS-BT was previously called NEMS-BRS.

AEO 2007 also varies the forecasted energy prices for all three economic growth cases. Different economic growth scenarios will affect the rate of growth of energy demand.

13.2 METHODOLOGY

The electric utility impact analysis will consist of NEMS-BT forecasts for generation, installed capacity, sales, and prices. The gas utility impact analysis will consist of NEMS-BT forecasts for sales. NEMS provides reference case load shapes for several end uses. The model uses predicted growth in demand for each end use to build up a projection of the total electric system load growth for each region, which it uses in turn to predict the necessary additions to capacity. NEMS-BT accounts for the implementation of efficiency standards by decrementing the appropriate reference case load shape. DOE will determine the size of the decrement using data for the per-unit energy savings developed in the life-cycle cost and payback period analysis (Chapter 8) and the forecast of shipments developed for the national impact analysis (Chapter 9).

The predicted reduction in capacity additions is sensitive to the peak load impacts of the standard. DOE will investigate the need to adjust the hourly load profiles that include this end use in NEMS-BT.

Since the *AEO2007* version of NEMS forecasts only to the year 2030, DOE must extrapolate results to 2042. DOE conducts an extrapolation to 2042 to be consistent with the analysis period being used by DOE in the national impact analysis (NIA). It will not be feasible to extend the forecast period of NEMS-BT for the purposes of this analysis, nor does EIA have an approved method for extrapolation of many outputs beyond 2030. While it might seem reasonable in general to make simple linear extrapolations of results, in practice this is not advisable because outputs could be contradictory. For example, changes in the fuel mix implied by extrapolations of those outputs could be inconsistent with the extrapolation of marginal emissions factors. An analysis of various trends sufficiently detailed to guarantee consistency is beyond the scope of this work and, in any case, would involve a great deal of uncertainty. Therefore, for all extrapolations beyond 2030, DOE intends to use simple replications of year 2030 results; in this way results are guaranteed to be consistent. As with the *AEO* reference case in general, the implicit assumption is that the regulatory environment does not deviate from the current known situation during the extrapolation period. Only changes that have been announced with date-certain introduction are included in NEMS-BT.

For petroleum products, EIA uses the average growth rate for the world oil price over the years 2010 to 2025, in combination with the refinery and distribution markups from the year 2025, to determine the regional price forecasts. Similarly, EIA derives natural gas prices from an average growth rate figure in combination with regional price margins from the year 2025.

Although NEMS-BT provides estimates of changes in electrical utility infrastructure requirements as a function of end-use energy savings, it does not currently have the capability to calculate similar results for water and wastewater utilities. The water utility sector is more

complicated than either the electric utility or gas utility sector, with a high degree of geographic variability produced by a large diversity of water resource availability, institutional history, and regulatory context. DOE currently does not have access to tools that analyze water utility impacts. The U.S. Geological Survey, the U.S. Environmental Protection Agency, and DOE are conducting or initiating activities to study water and wastewater issues. However, these activities have yet to provide the necessary sources of data or tools to enable a water utility impact analysis comparable to the analysis of electric and gas utilities that is possible using NEMS. Therefore, conducting a credible water and wastewater utility analysis is beyond DOE's existing analysis capabilities.

13.3 RESULTS

Results of the analysis will include changes in residential and commercial electricity sales, installed capacity and generation by fuel type, and residential and commercial natural gas sales for each trial standard level, in five-year increments extrapolated to the year 2042.

REFERENCES

- ¹ U.S. Department of Energy-Energy Information Administration. *Annual Energy Outlook 2007 with Projections to 2030*, February, 2007. Washington, DC. DOE/EIA-0383(2007).